



## INVESTIGATOR'S ANNUAL REPORT

United States Department of the Interior  
National Park Service

All or some of the information you provide may become available to the public.

OMB # (1024-0236)  
Exp. Date (11/30/2010)  
Form No. (10-226)

<b>Reporting Year:</b> 2010	<b>Park:</b> Shenandoah NP	<b>Select the type of permit this report addresses:</b> Scientific Study																						
<b>Name of principal investigator or responsible official:</b> John Jones		<b>Office Phone:</b> (703) 648-5543																						
<b>Mailing address:</b> Research Geographer  U.S. Geological Survey  Eastern Geographic Science Center  521 National Center Reston, VA 20192 USA		<b>Office FAX</b> (703) 648-4163 <b>Office Email</b> jwjones@usgs.gov																						
<b>Additional investigators or key field assistants (first name, last name, office phone, office email)</b> <table><tr><td><b>Name:</b> Sharon Hamann</td><td><b>Phone:</b> (703)648-4128</td><td><b>Email:</b> shamann@usgs.gov</td></tr><tr><td><b>Name:</b> Dr. Douglas Muchoney</td><td><b>Phone:</b></td><td><b>Email:</b> dmuchoney@usgs.gov</td></tr><tr><td><b>Name:</b> Annette Elmore</td><td><b>Phone:</b> (703)648-4805</td><td><b>Email:</b> aelmore@usgs.gov</td></tr><tr><td><b>Name:</b> Cynthia Cunningham</td><td><b>Phone:</b> (703)648-4563</td><td><b>Email:</b> ccunningham@usgs.gov</td></tr><tr><td><b>Name:</b> Danielle Alliello</td><td><b>Phone:</b> (703)648-4233</td><td><b>Email:</b> daiello@usgs.gov</td></tr><tr><td><b>Name:</b> Dr. Stephan De Wekker</td><td><b>Phone:</b> (434)924-3324</td><td><b>Email:</b> dewekker@virginia.edu</td></tr><tr><td><b>Name:</b> Dr. Bradley C. Reed</td><td><b>Phone:</b> (703)648-5536</td><td><b>Email:</b> reed@usgs.gov</td></tr></table>				<b>Name:</b> Sharon Hamann	<b>Phone:</b> (703)648-4128	<b>Email:</b> shamann@usgs.gov	<b>Name:</b> Dr. Douglas Muchoney	<b>Phone:</b>	<b>Email:</b> dmuchoney@usgs.gov	<b>Name:</b> Annette Elmore	<b>Phone:</b> (703)648-4805	<b>Email:</b> aelmore@usgs.gov	<b>Name:</b> Cynthia Cunningham	<b>Phone:</b> (703)648-4563	<b>Email:</b> ccunningham@usgs.gov	<b>Name:</b> Danielle Alliello	<b>Phone:</b> (703)648-4233	<b>Email:</b> daiello@usgs.gov	<b>Name:</b> Dr. Stephan De Wekker	<b>Phone:</b> (434)924-3324	<b>Email:</b> dewekker@virginia.edu	<b>Name:</b> Dr. Bradley C. Reed	<b>Phone:</b> (703)648-5536	<b>Email:</b> reed@usgs.gov
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<b>Project Title (maximum 300 characters):</b> Investigation of Phenology as an Indicator of Climate Change in the Blue Ridge Ecoregion encompassing Shenandoah National Park																								
<b>Park-assigned Study or Activity #:</b> SHEN-00375	<b>Park-assigned Permit #:</b> SHEN-2010-SCI-0005	<b>Permit Start Date:</b> Feb 02, 2010	<b>Permit Expiration Date:</b> Dec 31, 2015																					
<b>Scientific Study Starting Date:</b> Feb 02, 2010		<b>Estimated Scientific Study Ending Date:</b> Dec 31, 2015																						
<b>For either a Scientific Study or a Science Education Activity, the status is:</b>  Continuing		<b>For a Scientific Study that is completed, please check each of the following that applies:</b>  <input type="checkbox"/> A final report has been provided to the park or will be provided to the park within the next two years  <input type="checkbox"/> Copies of field notes, data files, photos, or other study records, as agreed, have been provided to the park  <input type="checkbox"/> All collected and retained specimens have been cataloged into the NPS catalog system and NPS has processed loan agreements as needed																						
<b>Activity Type:</b> Research																								
<b>Subject/Discipline:</b> Atmosphere / Climate / Weather																								

**Purpose of Scientific Study or Science Education Activity during the reporting year (maximum 4000 characters):**

Forests in the Blue Ridge region are undergoing numerous changes due to land cover/land use change, successional processes and disturbances due to defoliating insects, air pollution, and fire. Global- or regional-scale climate changes may be compounding the disturbance regime and may have dramatic consequences to Appalachian mountain ecosystems. Vegetation phenology can be used to track changes in climate and measurements can be scaled from field observations to regional patterns evidenced in satellite imagery. We propose to investigate whether changes in phenology are evident in Shenandoah National Park through the use of time sequenced satellite imagery, field investigations, and spatial modeling. We will also combine various meteorological data, ground collected imagery, and non-destructively measured vegetation characteristics (e.g., field based measurements of tree height) to examine relationships among terrain, microclimate, and vegetation composition/structure.

**Findings and status of Scientific Study or accomplishments of Science Education Activity during the reporting year (maximum 4000 characters):**

The Shenandoah National Park is a difficult environment in which to operate sensitive and complex meteorological instruments over the long-term. In 2010 we continued to maintain and operate 7 weather stations placed in the Park to provide good representation of various micro-climates. Tree fall over the winter damaged 2 of the 7 systems, while bears caused repeated, partial damage to 3 others. Damaged systems were repaired and data for all stations was downloaded and processed for quality assurance. We published a report that details the quality control processing performed on these data and summarizes the periods of coverage that have been achieved thus far â through this effort. The citation for this report is:

Jones, J. W., Aiello, D. P., Osborne, J. D., 2010, Shenandoah National Park Phenology Projectâ Weather data collection, description, and processing: U.S. Geological Survey Open-File Report 2010â 1272, 17 p.

As of January 31, 2010, this report is available on-line at: <http://pubs.usgs.gov/of/2010/1272>

We also continued to maintain and operate a web-enabled phenology camera that displays and records an image of Park vegetation and sky conditions every 10 minutes during high-sun hours of each day. These images can be viewed through links found at: <http://egsc.usgs.gov/>

This project is focused on the use of satellite remote sensing for landscape phenology analysis. Image data for the Park were collected, calibrated and analyzed this year as part of a student internâ s summer employment. This work will contribute to that studentâ s Doctoral dissertation research at the Virginia Technical University (Va. Tech). Preliminary findings of this research were presented at the Annual Meeting of the American Geophysical Union December 7, 2010 in San Francisco. The citation for this presentation is:

A Hudson-Dunn, J Jones and J Brown 2010. An Intercomparison of Annual Seasonality estimates in the Shenandoah National Park from 2000 to 2009 Abstract B23G-0465 presented at 2010 Fall Meeting, AGU, San Francisco, Calif., 13-17 Dec

**For Scientific Studies (not Science Education Activities), were any specimens collected and removed from the park but not destroyed during analysis?**

No

**Funding specifically used in this park this reporting year that was provided by NPS (enter dollar amount):**  
\$0

**Funding specifically used in this park this reporting year that was provided by all other sources (enter dollar amount):**  
\$30000

**List any other U.S. Government Agencies supporting this study or activity and the funding each provided this reporting year:**

**Paperwork Reduction Act Statement:** A federal agency may not conduct or sponsor, and a person is not required to respond to a collection of information unless it displays a valid OMB control number. Public reporting for this collection of information is estimated to average 1.625 hours per response, including the time for reviewing instructions, gathering and maintaining data, and completing and reviewing the forms. Direct comments regarding this burden estimate or any aspect of this form to Dr. John G. Dennis, Natural Resources (3127 MIB), National Park Service, 1849 C Street, N.W., Washington, DC 20240.